The Cybersyn Revolution

BY
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Five lessons from a socialist computing project in Salvador Allende's Chile.

While we're often told that the past holds lessons for how to approach the present, we rarely look to older technologies for inspiration. Rarer still is it to suggest that the historical experiences of less industrialized nations may have something to teach us about the technological problems of today — let alone that a decades-old socialist project might offer ways to think about technologies touted by Silicon Valley capitalists.

Yet a computing system built in socialist Chile in the 1970s — Project Cybersyn — offers inspiration on how we should be thinking about technology and data today.

Project Cybersyn was a bold technological project tied to a bold political project. It emerged in the context of Chile's peaceful road to socialism: Salvador Allende had won the Chilean presidency in 1970 with a promise to build a fundamentally different society. His political program would make Chile a democratic-socialist state, with respect for the country's constitution and individual freedoms.

Giving the state control of Chile's most important industries constituted a central plank of Allende's platform, but created management difficulties. The government had limited experience in this area. Yet by the end of 1971, it had taken control of more than one hundred and fifty enterprises, among them twelve of the twenty largest companies in Chile.

The problem of how to manage these newly socialized enterprises led a young Chilean engineer named Fernando Flores to contact a British cybernetician named Stafford Beer and ask for advice. Flores worked for the government agency charged with the nationalization effort; Beer was an international business consultant known for his work in the area of management cybernetics, which he defined as the "cybernetics of effective organization."

Together, they formed a team of Chilean and British engineers and developed a plan for a new technological system that would improve the government's ability to coordinate the state-run economy.

The system would provide daily access to factory production data and a set of computer-based

tools that the government could use to predict future economic behavior. It also included a futuristic operations room that would facilitate government decision-making through conversation and better comprehension of data. Beer envisioned ways to both increase worker participation in the economy and preserve the autonomy of factory managers, even with expanding state influence.

Members of the Chilean government believed the system would bolster the success of Allende's economic program and, by extension, Chile's socialist revolution. Beer named the system Cybersyn in recognition of *cybernetics*, the scientific principles guiding its development, and *synergy*, the idea that the whole of the system was more than the sum of its technological parts.

Even decades removed from its inception, Project Cybersyn still holds valuable lessons for today. First, it reminds us that the state plays an important role in technical design, and can help shape innovations that aim to benefit society and support marginalized groups rather than achieve narrow efficiency goals or single-mindedly increase profits. Second, we need to be vigilant about the ways in which design bias can limit the efficacy of technologies for increased democratic participation and inclusion.

Third, while the current stream of new products suggests that technologies become obsolete quickly, using older technologies can actually solve problems while holding down costs and generating less waste. Fourth, protecting privacy is necessary to prevent potential abuses of centralized control of data. Finally, we need to think creatively about changing social and organizational systems if we want to get the most out of technology; technological innovation alone will not make the world a better place.

1 The state and its priorities shape how technology is designed and used.

The state plays an important role in shaping the relationship between labor and technology, and can push for the design of systems that benefit ordinary people. It can also have the opposite effect. Indeed, the history of computing in the US context has been tightly linked to government command, control, and automation efforts.

But it does not have to be this way. Consider how the Allende government approached the technology-labor question in the design of Project Cybersyn. Allende made raising employment central both to his economic plan and his overall strategy to help Chileans. His government pushed for new forms of worker participation on the shop floor and the integration of worker knowledge in economic decision-making.

This political environment allowed Beer, the British cybernetician assisting Chile, to view computer technology as a way to empower workers. In 1972, he published a report for the Chilean government that proposed giving Chilean workers, not managers or government technocrats, control of Project Cybersyn. More radically, Beer envisioned a way for Chile's workers to participate in Cybersyn's design.

He recommended that the government allow workers — not engineers — to build the models of the state-controlled factories because they were best qualified to understand operations on the shop floor. Workers would thus help design the system that they would then run and use. Allowing workers to use both their heads and their hands would limit how alienated they felt from their labor.

Beer's idea for democratic participation had its flaws: for example, he didn't consider how coding worker knowledge into the software of a computer system might result in the eventual disempowerment of workers, especially if the political context changed.

But Beer showed an ability to envision how computerization in a factory setting might work toward an end other than speed-ups and deskilling — the results of capitalist development that labor scholars such as Harry Braverman witnessed in the United States, where the government did not have the same commitment to actively limiting unemployment or encouraging worker participation.

Braverman published his classic text *Labor and Monopoly Capital* in 1974, at around the time Beer was working for the Allende government. In it, he observed how technologies like computer-controlled machinery contribute to the automation of labor and lead to the deskilling of workers, even in highly specialized fields such as engineering.

He found the same process at work in the context of office computer use. Computers make office work increasingly routinized and give management an easy way to monitor the amount of labor each operator has put in. The increased speed of work has the potential to result in more layoffs.

Beer saw computerization differently, not least because the Chilean state insisted that its socialist computer system be designed for different ends than the ones that Braverman described. This gave Beer the freedom to reconceptualize how technologies might shape work on the shop floor and to see computers as a means of empowering workers.

Project Cybersyn shows that the state can create the conditions for new directions in design thinking. The state can require (and inspire) technologists to consider how systems benefit the interests of the broader citizenry, which may or may not align with profit, market success, efficiency, technical elegance, or coolness in system design. Computer innovation wasn't born with Silicon Valley startups, and it can thrive by taking on design considerations that fall outside the scope of the market.

2 The systems of the future must be free of the biases of today.

Inherited biases won't be shed overnight, which is why we need to remain vigilant about the ways bias can enter into and shape system design. Left unchecked, technologies for increased democratic participation and improved human-machine interaction can also exclude and marginalize sectors of the population. Here, too, Project Cybersyn offers important insights.

Project Cybersyn is best known for its operations room, a futuristic-looking space that was designed to facilitate democratic decision-making. It consisted of seven chairs arranged in a circle within a hexagonal room. The design team insisted on an odd number of chairs to prevent a tie when voting. They also rejected the presence of a table, which they felt encouraged the shuffling of papers instead of lively discussion.

A series of screens lined the walls of the room that displayed data on the state of the economy as well as warning signals indicating areas in need of urgent government attention. The wall displays used color, light, and graphic design in ways that helped occupants quickly grasp the complexities of Chile's industrial sector. Early plans for the room even included space for a minibar.

The chairs in the room exhibited similar hallmarks of careful design thinking. For example, occupants would navigate the displays of information using the "big hand" buttons located in the armrests of the chairs. These large geometrical buttons replaced the traditional keyboard and reflected the class awareness of the design team. They reasoned that Chilean workers would not have experience using a keyboard, and that the geometric buttons offered a user-friendly alternative that allowed for worker participation.

The team considered high-level government officials as the other likely users of the room. These officials also had limited keyboard experience, but for a different reason: they had female secretaries. As Beer noted, adopting a keyboard would "insinuate a girl between themselves and the machinery … [when it] is vital that the occupants interact directly with the machine, and with each other."

The buttons therefore provided a way to eliminate women from this decision-making space. They also encouraged forms of masculine expression. As Beer wrote, the buttons could be "thumped" when an occupant wanted to make a point.

Such design decisions were not neutral. They reflected who the design team believed would hold power in Chile's revolutionary context and enforced that vision. Male factory workers and

government bureaucrats would have decision-making power. Other kinds of workers, such as clerical workers, and women, would not.

These design decisions illustrate a shortcoming in Chile's revolutionary imagination. They also illustrate how our assumptions about gender and class can travel with us, even as we imagine a future that is more egalitarian and just.

3 We can do more with less, and help the environment in the process.

New technologies come with significant environmental costs in terms of the consumption and disposal of electronic devices. Global sales of electronic devices doubled between 1997 and 2009. According to the Environmental Protection Agency, in 2009, people in the United States disposed of 29.4 million computers and 129 million mobile devices. The US had the highest amount of e-waste in the world in 2012, with a reported 9.4 million metric tons generated. Much of this waste is handled in places like China, India, and Pakistan, where the recovery of valuable materials such as gold can expose workers to lead and other toxic metals.

The current market for electronic products depends on planned obsolescence: old products quickly become outdated and unfashionable. But extending the life of our electronic devices helps to address the e-waste problem. Project Cybersyn showed that it is possible to create a cutting-edge system using technologies that are not state-of-the-art. It demonstrates that the future can be tied to the technological past.

When Project Cybersyn was built during the 1970s, there were approximately fifty computers in all of Chile, and most were outdated. Nor could Chile call up IBM for help. IBM decreased its operations in Chile following Allende's election because they feared the Chilean government would nationalize them. The Nixon administration had also instituted an "invisible blockade" to destabilize the Chilean economy and prevent Latin America from becoming a "red sandwich" with Cuba on one side and Chile on the other. This further limited Chile's ability to import US technology.

As a result, Beer and the Chilean team came up with an ingenious way to create the data-processing network they needed to link the country's factories to the central command center: they would connect the one outdated computer they had for the project to another technology that was not state-of-the-art: the telex machine — or rather, several hundred of them. And it worked.

In 1972, a national strike that grew to include forty thousand truck drivers threw the country into a state of emergency and disrupted the distribution of food, fuel, and raw materials for factory production. The government used the telex network created for Project Cybersyn to determine which roads were open, coordinate the distribution of key resources, and maintain factory production.

The Cybersyn network improved government communication and substantially increased the speed and frequency at which the government could send and receive messages along the length of the country. It lacked the technological sophistication of ARPANET, the US military communications system that was the forerunner of the Internet and a contemporary of Chile's telex system. But the Chilean network used fewer technical resources at a lower cost and proved highly functional nonetheless. Older technologies were creatively re-envisioned and combined with other forms of organizational and social innovation.

New technology isn't actually as immaterial as many would think. We often speak of our data being stored "in the cloud" — a notion that implies a lack of physicality. But data farms depend on substantial quantities of natural resources. A 15-megawatt data center can use up to 360,000 gallons of water per day, and the recently completed NSA Utah Data Center requires a million gallons of water per day and 65 megawatts of power. A progressive transformation of new technologies would encourage greater selectivity in data collection and challenge the practice of storing of vast amounts of data simply because we can.

Project Cybersyn also demonstrates that more can be done with less. The Chilean project did not try to copy the Soviets' form of economic cybernetics, which collected a wealth of factory data and sent it to a centralized hierarchy of computer centers for further processing. It accomplished the same task by transmitting only ten to twelve indexes of production daily from each factory and having factory modelers spend more time thoughtfully identifying which indexes were most important.

4 Privacy protection can mean the difference between an abusive system and a system that protects and promotes human freedom.

Protecting privacy is key to preventing abuses of centralized control. New technological

innovations such as smartphones, the increased use of data-driven analytics, and the push to create smart cities and an "Internet of Things" all make the collection of data easier and permit the recording of vast amounts of human and nonhuman activity.

In the 1970s, critics often characterized Project Cybersyn as a form of authoritarian, centralized control because it collected data on factory activities and channeled them to the Chilean government. *New Scientist*, for example, ran an editorial that declared, "If this [Project Cybersyn] is successful, Beer will have created one of the most powerful weapons in history."

But such interpretations confused how the system actually operated. The misinterpretation was often ideological — in Chile they were tied to more general criticisms of the Allende government by the right-wing political opposition, which claimed that the Allende government was destroying Chilean civil liberties.

In fact, Project Cybersyn did not function as a form of abusive centralized control because it included mechanisms to protect and preserve factory autonomy. These protections were engineered into the system's design. The government, for example, could intervene in shop-floor activities only after the software detected a production anomaly *and* the factory failed to resolve the anomaly within a set period of time.

Human and technological limitations placed an additional check on government intervention. Operators in the factory, for example, could not monitor thousands of production indexes a day, but they could track ten to twelve of the most important. Limiting the number of indicators also made it easier for the software to detect the most pressing emergencies in need of government action. However, it required Chilean engineers to make decisions about which data the government truly required.

Such limitations made much of the factory's activity invisible to the Chilean government, preserved freedom, and protected Chilean workers from Orwellian abuse. They created a layer of privacy that could have allowed workers to participate in economic management without the overbearing control of outside state bureaucrats.

Beer's framing of Project Cybersyn also gave the workers a way to understand how this form of data-driven regulation worked by allowing them to create the factory models that formed the basis of the Cybersyn software. Theoretically, it allowed them to open up the black box of the computer and understand the operation of the analytical processing taking place within it.

Only theoretically, however, because the Allende government was cut short by a military coup that resulted in the death of President Allende and ended Chilean democracy for the next seventeen years. Military dictatorship and economic policies often described as "neoliberal shock treatments" ended work on Project Cybersyn before it reached completion. For advocates of economic liberalism, it made no sense to have a computer system that helped the state

regulate industrial production.

Nevertheless, Beer's framework is useful because it reminds us of the importance not just of computational transparency, but of democratic control. If code is law, as Lawrence Lessig famously proposed, then the code used in the new technologies that shape our lives should not be the exclusive domain of engineers and programmers.

5 We need to think big, because technology alone will not create a better world.

We need to be thinking in terms of systems rather than technological quick fixes. Discussions about smart cities, for example, regularly focus on better network infrastructures and the use of information and communication technologies such as integrated sensors, mobile phone apps, and online services. Often, the underlying assumption is that such interventions will automatically improve the quality of urban life by making it easier for residents to access government services and provide city government with data to improve city maintenance.

But this technological determinism doesn't offer a holistic understanding of how such technologies might negatively impact critical aspects of city life. For example, the sociologist Robert Hollands argues that tech-centered smart-city initiatives might create an influx of technologically literate workers and exacerbate the displacement of other workers. They also might divert city resources to the building of computer infrastructures and away from other important areas of city life.

He contends that progressive smart cities should first try to understand human interactions in urban environments and how they systematically produce power inequalities. Technologies should then be integrated into city environments in ways that ameliorate these disparities.

Beer shared Hollands' perspective. Throughout the Cybersyn Project, Beer repeatedly expressed frustration that Cybersyn was viewed as a suite of technological fixes — an operations room, a network of telex machines, an economic simulator, software to track production data — rather than a way to restructure Chilean economic management.

Beer was interested in understanding the *system* of Chilean economic management and how government institutions might be changed to improve coordination processes. He viewed

technology as a way to change the internal organization of Chile's government.

If he were alive today, Beer would undoubtedly lament that e-government initiatives to put existing forms online or computerize existing processes miss opportunities to make organizations themselves more effective.

We must resist the kind of apolitical "innovation determinism" that sees the creation of the next app, online service, or networked device as the best way to move society forward. Instead, we should push ourselves to think creatively of ways to change the structure of our organizations, political processes, and societies for the better and about how new technologies might contribute to such efforts.

The challenges faced by Cybersyn's protagonists were not unique to their era — we will face similar ones. While the project was far from perfect, its lessons should not be ignored by those seeking a future where technology is democratically harnessed for social good.

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